

Space Weather Stakeholders Meeting

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Joseph Chan
Senior Manager, Flight Dynamics
Intelsat

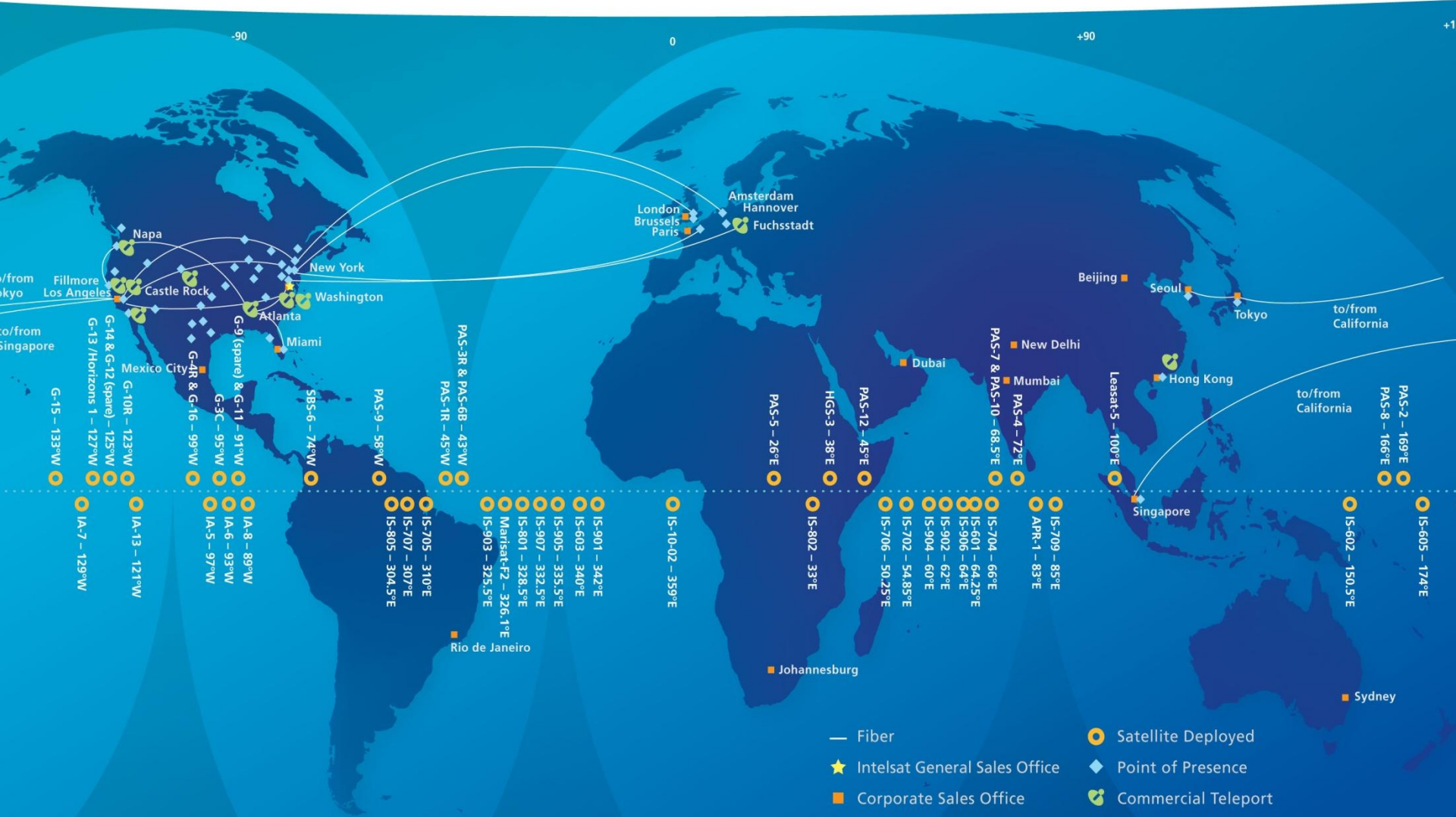
Intelsat Operations at a Glance

- **The largest commercial fleet in the world**
- **Satellites over all continents and oceans**
- **Highly robust ground segment configuration**
- **Very high operational efficiency**
- **Customers with no tolerance for outages**
- **Our success relies on superior situational awareness**

Fleet Operated by Intelsat (as of April 2012)

- **Current: 77 satellites**
 - 53 Intelsat spacecraft & 24 for 3rd party customers
 - 76 Geosynchronous & one Medium Earth Orbit spacecraft
 - 3 HEIO
 - 48 operated prime from ESOC
 - 29 operated prime from LSOC
- **5 to be launched in 2012**
- **Third party customers: DirecTV, ICO, HNS, SXM, WorldSpace**
- **Two Operations Centers: WDC and Long Beach, CA**

The Intelsat Satellite Network



77 satellites currently operated

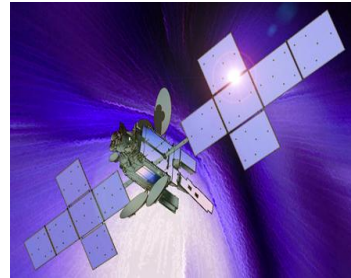
from all major spacecraft manufacturers



**Boeing 601,
702, Spinners
25 spacecraft**



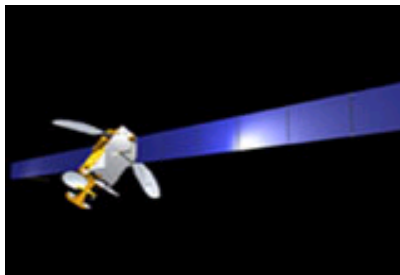
**Lockheed Martin
7000 series
2 spacecraft**



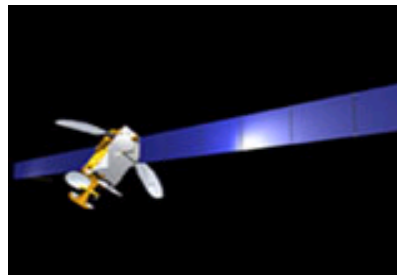
**S/S Loral FS1300
36 spacecraft**



**Orbital Star 2
9 spacecraft**



**IAI
1 spacecraft**



**EADS Astrium
Eurostar 2000/3000
3 spacecraft**

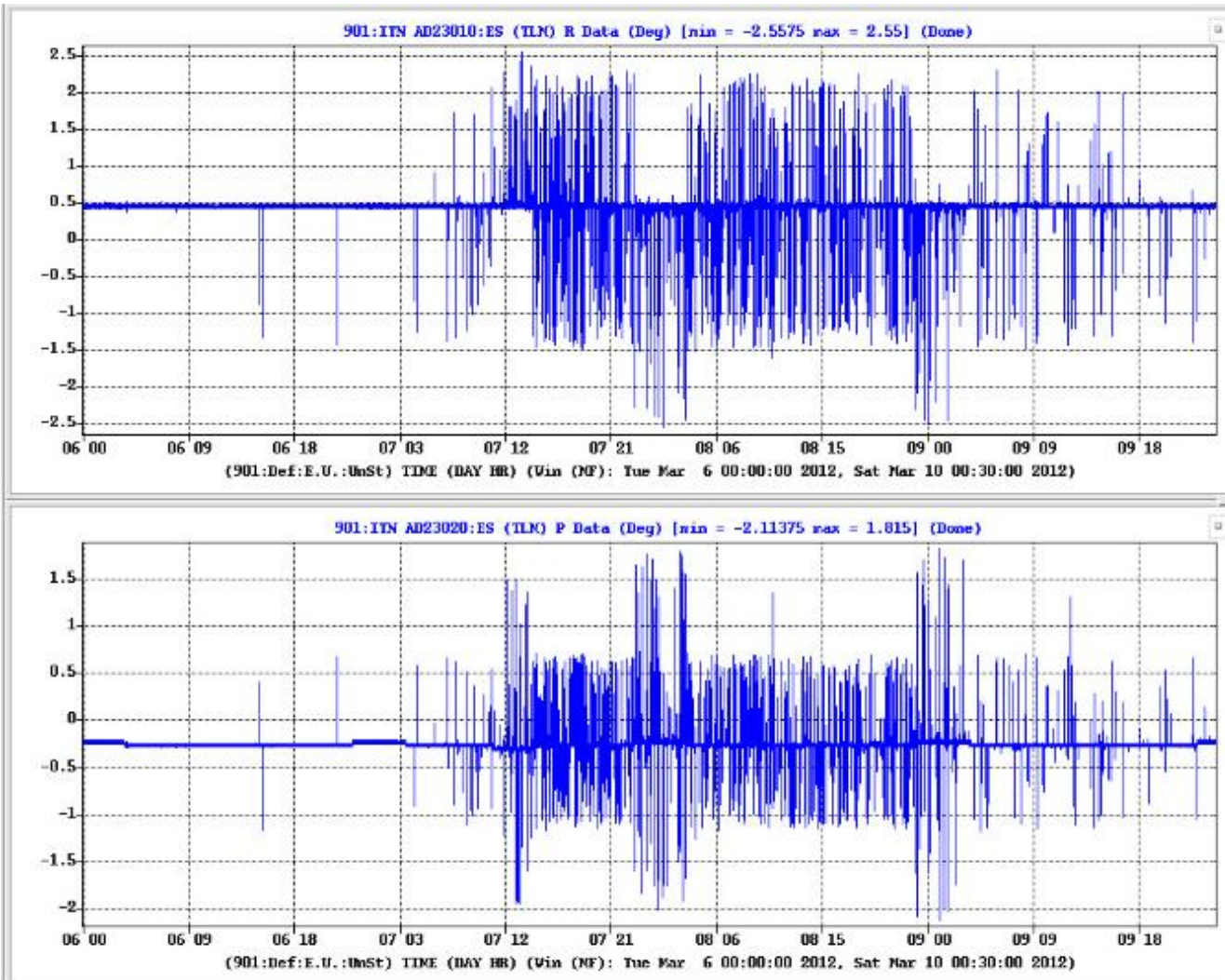


**Thales
Spacebus 3000B
1 spacecraft**

Events Associated with Space Environment

- **Status Changes (Phantom Commands)**
 - SEU – single event upsets
 - ESD – electrostatic discharges
- **Solar Array degradation**
 - Solar Cell loss efficiency
 - Major impact to array power
- **Effects on Earth Sensors and Star Trackers**
 - Noise in sensors
 - Attitude transients
- **Magnetic Torquer Trips**
 - Storm detector trips

Earth Sensor Noise during March 2012 Storm



How we operate today

- At present, space weather warnings are monitored only mode in our daily satellite operations
 - No clear correlation between observed events and space weather alerts
 - Similar events are observed when there are no storm warnings
 - Expected events are not observed when there are severe storm warnings
 - No standard protocols for responding to space weather
 - Cannot run and cannot hide
 - Considered in anomaly investigations

How we operate today (cont'd)

- No clear correlation between space weather events and satellite anomalies
 - Experiences with past major anomalies, lost capacities and on-station failures are linked to space weather as a “possible” cause but lacks direct correlations with specific alerts based on anomaly investigations conducted by satellite manufactures and independent consultants
 - Most anomalies did not coincide with timing of published major storm events
 - Difficulty due accumulative effects – bath tub effect

What data we would like

- Easy access to space weather information focused on satellites in geostationary orbit
- Advanced warning enhanced weather conditions of the severity, time frame and regions most affected
- Recommendations, based on industry standards, on how to respond to different space weather conditions
- Development of agreed protocols for determining whether satellite anomalies are attributable, in whole or in part, to space weather
- Manufacturer/operator consensus on worst-case environment for the satellite – design and testing in GEO space environment
- Industry standard specification for design and space insurance purposes

Working Together

- Spatial resolution of sensors
 - Commercial geostationary satellites provide longitude distributions to monitor the space weather related events globally improving model resolutions
- Better analysis of historic data from archives
 - Work to provide other satellite telemetry data and event log to correlate with space weather sensor data
- Increase capabilities around the globe to improve models:
 - Hosted payload for up coming satellites (faster/cheaper)
- Data center for observed space weather events
 - Anonymous web based data center for operators to enter observed major events with possible cause from space weather (data content and design TBD)
 - Correlation analysis data and discussion available to registered operators via data center to help with anomaly investigation

Joseph Chan
Senior Manager, Flight Dynamics
Intelsat
Email: joseph.chan@intelsat.com



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